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EVALUATION OF DEBRIDEMENT TECHNIQUES FOR ENDODONTIC INSTRUMENTS

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ABSTRACT

Files, reamers, and Hedstrom files were used to instrument both wet and dry canals and then cleansed by a chairside technique. Statistical analysis of the various cleansing techniques showed that 2 by 2 inch gauze wipes, either wet or dry, cleansed the instruments of debris better than any other method tested.

Root canal debridement is normally accomplished using sterile reamers and files along with various antimicrobial irrigants.^{1,2} The instruments are sterilized by steam autoclave or dry heat before usage and by bead or salt sterilizers at chairside. These methods have been found to be satisfactory if used according to accepted standards.³ Prior to sterilization, complete cleansing of the instruments is necessary to eliminate any organic debris remaining on the instrument which may interfere with sterilization.⁴ Although many methods have been advocated for cleansing instruments, the two most common methods are hand scrubbing and use of the ultrasonic cleaner.⁵ Hand scrubbing although effective, is time consuming and effectiveness depends greatly on the dedication of the assistant.

The advertised advantages of the ultrasonic cleaner are that it requires neither the time nor the vigilance of an operator during the cleansing procedures. The ultrasonic cleaner produces ultra high-frequency sound waves which result in the formation of microscopic bubbles on the instruments. These bubbles constantly collapse inward creating a physical cleansing action of pressure and heat.⁶

As noted previously, proper cleansing of instruments is mandatory prior to sterilization and requires the most effective and efficient method of accomplishing this. In endodontic therapy cleansing actions are required at two points in time: (1) instruments must be cleansed prior to or between uses and (2) during their use.^{7,8} It is well accepted that unless debris is frequently removed from the flutes of files and reamers during their use, packing of dentinal shavings and their resultant blockage of the canal may occur.² It is also assumed that

debris clogged reamers and files exhibit a lower cutting potential and may increase chance of fracture.^{9,10}

Unfortunately, there have been no reports in the literature evaluating different techniques for cleansing endodontic instruments at chairside. The purpose of this study was to compare several commonly used methods of cleansing instruments to determine the most effective method.

METHODS & MATERIALS

In this study 270 new standard size 25 instruments (thirty files, thirty reamers, thirty Hedstrom files) from three different companies were removed from their packages and cleansed by using gauze wipes in a twisting motion and sonication in alcohol for 4 minutes. This was found to be the best method of cleansing new instruments in a pilot study.

After the instruments were cleaned, all 270 of them were used to instrument canals on extracted teeth. The instrumentation was performed first in wet canals irrigated with 2.5% sodium hypochlorite. After obtaining visual debris, 10 millimeters up from the tip of the instrument, they were cleansed by one method and rated. Instrumentation was repeated in dry canals with clean instruments and the cleansing techniques again rated. The methods employed for cleaning were cotton rolls, dry or wet; 2 by 2 gauze, dry or wet; stretched rubber dam and foam sponge soaked with Sparkle.*

Five files, five reamers, and five Hedstrom files were used for each method of cleaning. In all the methods of cleaning only one stroke was used in passing the instrument through the cleansing media. No

control of force exerted on cleansing was attempted although all wipes were performed by the same individual and in the quickest way possible. After this, the instruments were examined for debris.

A holder described in a previous study especially fabricated to resist movement of the files while being examined was used.¹¹

All instruments were handled only by the plastic handle. At no time was the instrument blade touched. The files and reamers were examined under a stereomicroscope at 37.5 times magnification. The amount of debris on each instrument was rated on a scale from one to four. A score of one represented an instrument completely free of debris. The scores were statistically compared using the Chi-square technique and the method of Cochran.¹²

RESULTS

The various methods of cleaning instruments at chairside (gauze - wet or dry; cotton roll - wet or dry; stretched rubber dam; or foam sponge) were evaluated to determine their efficiency and subjected to Chi-square analysis. The result of the analysis of a 9 by 2 contingency table resulted in a significant Chi-square ($\chi^2 = 42.78$; $df = 8$; $p = <.001$) indicating that there was significant differences in the methods of cleaning. The data were partitioned according to the method of Cochran¹² and the results of the analysis indicated gauze was the most effective methods of cleaning used instruments whether the gauze was wet or dry ($\chi^2 = 12.99$; $df = 2$; $p = <.001$).

Efforts to remove debris using chairside techniques were disappointing. Some methods appeared to have cleansed the instruments but in fact had left a large amount of debris when examined at 37.5 times magnification.

Debris was always left on the instruments regardless of the cleansing method employed. Cotton rolls and gauze (either wet or dry) tended to leave fibers tangled within the flutes, particularly in Hedstrom files (Fig. 1). The rubber dam and foam sponge left particles of their own material behind on the instruments (Fig. 2). They also lacked the necessary pressure to dislodge debris.

When dry canals were instrumented the visual debris on the instruments could be seen to drop off with the slightest jarring action so that less pressure was needed to remove the dentinal debris. Another side observation noted during the study may also be important. Wire brushing the instruments tended to lift up metal spurs and was not considered successful in removing material (Fig. 3). Placing a gentle bend in these instruments with either bare fingers or a cotton plier is contraindicated. Bending a file between the fingers deposits numerous epithelial cells and bacteria (Fig. 4) while using a cotton plier causes destruction of the cutting edge and resultant spurs (Fig. 5).

DISCUSSION

Many methods for removing dentinal shavings at chairside have been advocated. Many authors recommend using a cotton roll, foam sponge, or other suitable material usually moistened with alcohol or other germicide to cleanse the intracanal instruments.^{2,7,8,13,14,15,16,17} The moistened 2 by 2 gauze wipe and cotton roll are probably the most frequently used methods for cleaning intracanal instruments at chairside, although many operators use a stretched sheet of rubber dam through which they insert the instruments.

There is agreement that clean intracanal instruments should be used during biomechanical debridement, but the best method of cleaning had not been shown. It has been reported that reamers dried and scraped with a wire brush retain dentin chips, oxide, or crystals undetectable by visual examination.¹⁸ As previously mentioned the use of a wire brush is contraindicated due to the amount of metal filings and spurs raised which produces the appearance as though the brush lifted and separated a coating from the base metal.

In conclusion it would appear that the preferred method of cleansing instruments of debris would be by use of a 2 by 2 inch gauze pad either wet or dry.

Although some cotton fibers were left on the instrument surface after cleansing, the greater effectiveness of the gauze in the cleansing more than compensated for its residual presence.

SUMMARY

Files, reamers, and Hedstrom files were used in both dry and wet canals and cleansed by various methods. Statistical analysis of the results showed that 2 by 2 inch gauze wipes either wet with alcohol or dry cleansed the instruments better than any other method tested.

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- FIGURE 1 File showing the normal amount of gauze fibers left behind from cleaning (orig mag X95).
- FIGURE 2 File with particles of rubber dam (*) left behind after cleaning (orig mag X100).
- FIGURE 3 File in which a wire brush has been used to remove debris. Note the roughened surface (orig mag X95).
- FIGURE 4 Two epithelial cells (E) with associated bacteria (B) after bending the file between two fingers (orig mag X1900).
- FIGURE 5 Destruction of the cutting edge after the use of a cotton plier to place a bend in the instrument (orig mag X200).



FIGURE 1



FIGURE 2

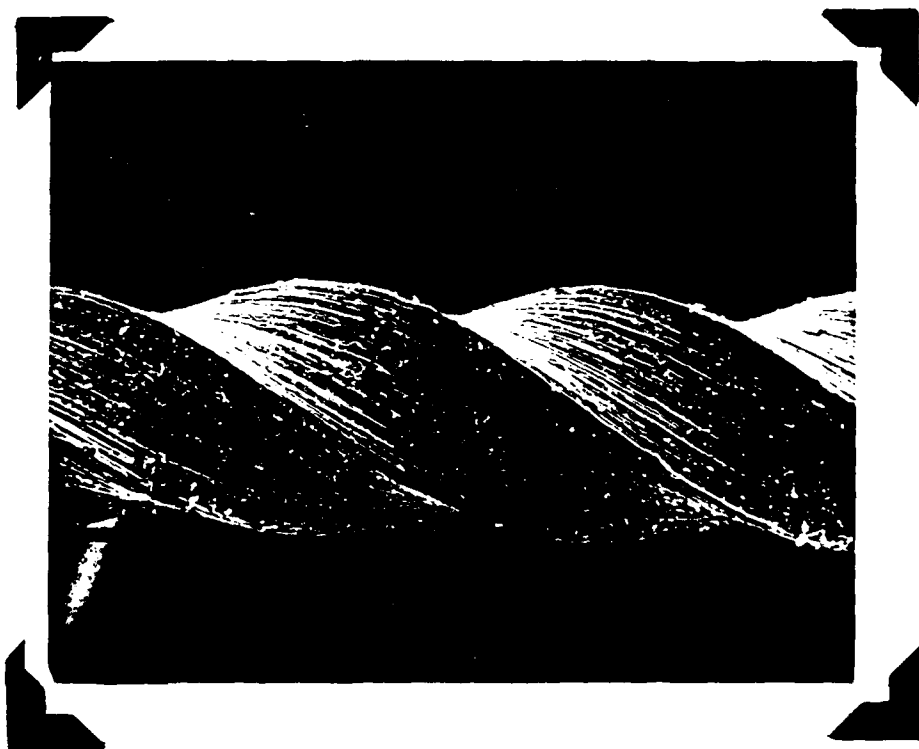


FIGURE 3

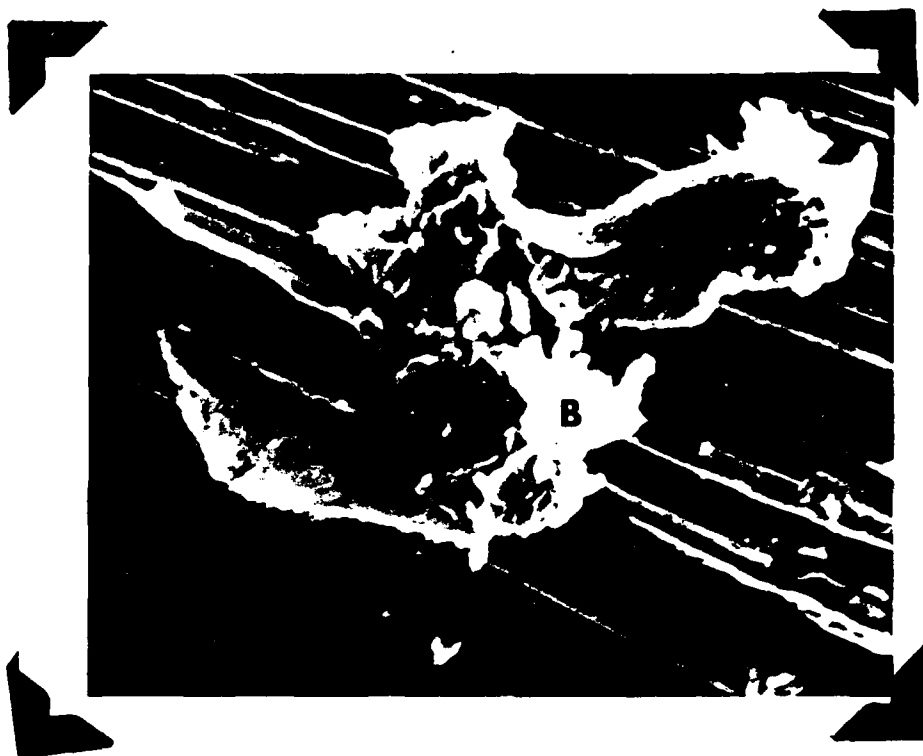


FIGURE 4

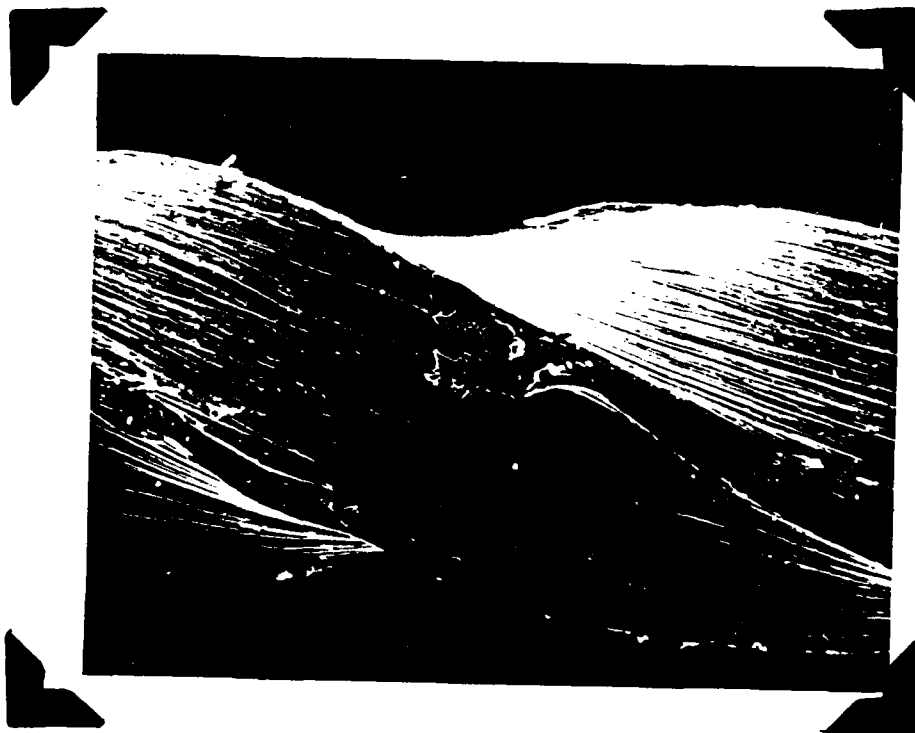


FIGURE 5